ماجستير العلوم في التكنولوجيا الحيوية
Master of Science in Biotechnology

التقنيات الحيوية من أسرع الصناعات نمواً في العالم حيث تقوم دول عديدة بالترويج لهذا القطاع كأساس للتطوير الاقتصادي في المستقبل .وتعرف التقنيات الحيوية بأنها تطبيقات لجوانب التقدم في بيولوجيا الخلية و البيولوجيا الجزيئية في مجالات الطب و الزراعة و البيئة وغيرها .و بفضل التقنيات الحديثة كهندسة الجينات مثلاً أصبحت التقنيات الحيوية تؤثر في مسارات مختلفة في الطب (السرطان، الطعومات، علاج و تشخيص الأمراض الوراثيه) وإنتاج الغذاء(النباتات المهجنة) والصناعة الدوائية .كما تشتمل التقنيات الحيوية على ميادين سريعة التطور مثل تكنولوجيا الأجسام المضادة وهندسة الجينات .وبواسطة التقنيات الحيوية تم تطوير جيل جديد من الأدوية و الطعوم والهرمونات والأدوية المضادة للالتهاب.

الأهداف ومخرجات التعلم المقصودة:

سوف يقدم هذا الماجستير ابحاث نظرية ومعملية لطلاب الدراسات العليا في تخصص التكنولوجيا الحيوية للتميز فى فى المجالات الآتية :

1. المعرفة وفهم النظريات والتقنيات ذات الصلة بمجالات التكنولوجيا الحيوية
2. تقنيات متقدمة جديدة من التكنولوجيا الحيوية في الطب و العلاج و الأغذية والزراعة والبيئة والصناعة
3. لمحة عامة عن عالم الميكروبات ودوره في مجال التكنولوجيا الحيوية.
4. الربط بين التطور التكنولوجي واقتصاد التشغيل والتنمية الاجتماعية الاقتصادية.
5. تنمية المجتمع والحفاظ على البيئة في ضوء التغيرات العالمية والإقليمية.
6. التعامل مع حقوق الملكية قانونياً وأخلاقياً.

تكون الدراسة علي مرحلتين

المرحله الاولي: دراسة نظرية لمده عام أكاديمي Pre-master courses

المرحله الثانية: تسجيل النقطة البحثية و إجراء الأبحاث المعملية و نشر بحث دولي واحد علي الأقل و كتابة الرسالة العلمية. و تمنح الدرجة بعد تحكيم الرسالة.

Pre-master Courses

1. Compulsory Courses:

First Semester							
Course code	Course title		Total Credit Hours	Lecture Credit Hours	Lab Credit Hours	Exam Duration (hour)	Final grades out of
	English	Arabic					
BT601	Advanced Microbiology	علم الأحياء الدقيقة المتقدم	1	1	0	1	50
BT602	Bioprocess and Fermentation Technology	العمليات الحيوية وتكنولوجيا التخمير	2	2	0	2	100
BT603	Biostatistics	الاحصاء الحيوى	2	2	0	2	100
BT604	Immuno-biotechnology	التكنولوجيا الحيوية المناعية	2	2	0	2	100
BT605	Molecular Biology	علم الأحياء الجزيئي	1	1	0	1	50
BT606	Proteomics and Enzymology	البروتينات وعلم الإنزيمات	2	2	0	2	100
GC601	Scientific thinking and writing	التفكير والكتابة العلمية	1	1	0	1	50
Second Semester							
Course code	Course title		Total Credit Hours	Lecture Credit Hours	Lab Credit Hours	Exam Duration (hour)	Final grades out of
	English	Arabic					
BT608	Biotechnology of Special Systems	أنظمة خاصة بالتكنولوجيا الحيوية	2	2	0	2	100
BT609	Concepts of Bioinformatics	مفاهيم المعلوماتية الحيوية	2	2	0	2	100
BT610	New Trends in Biotechnology	الاتجاهات الحديثة في التكنولوجيا الحيوية	2	2	0	2	100
BT611	Genetic Engineering	الهندسة الوراثية	2	2	0	2	100
BT612	Research proposal and development	اقتراح البحث والتطوير	2	2	0	2	100
BT613	Systematic Reviews	مراجعات منهجية	1	1	0	1	50

2. Elective courses:

Elective Courses							
Course code	Course title		Total Credit Hours	Lecture Credit Hours	Lab Credit Hours	Exam Duration (hour)	Final grades out of
	English	Arabic					
BT614	Chemical and Biochemical Engineering	الهندسة الكيميائية و الكيمياء الحيوية	2	2	0	2	100
BT615	DNA Sequencing and analysis	تسلسل وتحليل الحمض النووى	2	2	0	2	100
BT616	Molecular pharmacology and pharmacogenomics	علم الأدوية الجزيئي وعلم الصيدلة الجينية	2	2	0	2	100
BT617	Molecular Phylogenetic Techniques	تقنيات الفيلوجينية الجزيئية	2	2	0	2	100
BT618	Nanoscience in biotechnology	علم النانو في مجال التكنولوجيا الحيوية	2	2	0	2	100

To complete the pre-requisite courses (pre-master courses) you should finish total credit hours = 26

[Compulsory Courses (22 credit hours) + Elective Courses (4 credit hours)]

Course Specifications

BT601 Advanced Microbiology

Ultrastructure of a bacterial cell, fungal cell. Microbial growth and metabolism. Virology, bacteriophage, viroids and virusoids. Applications of different microorganisms in Biotechnology.

BT602 Bioprocess and Fermentation Technology

Isolation and preservation of industrial cultures, selection, design and operation of fermenter. Aerobic respiration, Different fermentation processes; batch, fed batch and continuous culture. gas production in fermentation. Types of Bioreactors. Process variables and process control. On-line and off-line analytical instruments. Scaling up. Sterilization.

BT603 Biostatistics

Statistical methods and reasoning, with an emphasis on the techniques and terms commonly encountered in research, are presented as tools for students to determine the impact of research on practice, especially in the areas of probability and statistical inference. Statistical software is used extensively to perform and simplify statistical calculations.

BT604 Immuno-biotechnology

This course is designed to provide students with a comprehensive background in immunology and immunochemistry in biotechnology. Topics range from antibodies as tools in Over-The-Counter and research immunoassays to genetic and molecular modifications of cells reactive in cancer immunotherapy. The immunological and immunochemical basis for these applications are stressed.

BT605 Molecular Biology

Organization of gene and Chromosomes. Structure, function and synthesis of DNA. Prokaryotic and Eukaryotic DNA replication, chromosomal abnormalities. Gene mutations, Site directed mutagenesis. DNA Repair. Genetic code. Prokaryotic and eukaryotic translation (Protein biosynthesis). Apoptosis, molecular biology techniques, PCR, real time PCR, microarray.

BT606 Proteomics and Enzymology

Provides an overview on the use of proteomics in biomarker discovery for disease detection. Students will also be introduced to methodology and techniques in protein extraction, separation and detection. Proteomics significance in Biotechnology.

Classification of enzymes and enzyme kinetics. Factors affecting rate of enzymatic reactions. Enzyme Cofactors and Mechanism of Enzyme Catalysis. Regulation of Enzyme activity. Enzyme immobilization and Biotransformation

GC601 Scientific Thinking and Writing

Scientific Planning – How to use a research engine - How to write a proposal – How to write a paper – Research ethics – Publication – social media.

BT608 Biotechnology of Special Systems

Cell and tissue culture, Stem cells, Transgenic organisms, drug targeting, complex diagnostic kits, vaccinology, transplantation biotransformation, and marine biotechnology

BT609 Concepts of Bioinformatics

This course instructs students on computer analytical methods for gene identification, promoter analysis, and introductory gene expression analysis using software methods. Additionally, students are introduced to comparative genomics and proteomic analysis methods. Students will become proficient in annotating large genomic DNA sequences.

BT610 New Trends in Biotechnology

The course aims to expose students to new advanced trends in biotechnology and to a range of new and emerging technologies.

Different modules like diagnostics, biofuel, renewable energy, water treatment, stem cells, transplantation, transgenic organisms and biotransformation, can be included (varies from term to term). Students will have the opportunity to apply their knowledge to propose and present solutions to emerging environmental or medical problems. This can be achieved by lectures, directed learning, open discussion, individual consultation and team based tasks.

BT611 Genetic Engineering

Recombinant DNA technology, gene cloning vectors, cloning strategies, competent cells. Selection, Screening & analysis of recombinant. DNA Sequencing. Methods of gene regulation in Eukaryotes (Antisense RNA, PNA &RNAi). Relevance and applications of these techniques in medicine and industry.

BT612 Research proposal and development

Written proposal in the form of a research grant application involving an industry partner

BT613 Systematic Reviews

Upon successfully completing this course, students will be able to; Explain the essential steps of performing a systematic review addressing a biotechnology question, Critically appraise a published systematic review, and finally Describe the challenges associated with performing and interpreting systematic reviews

BT614 Chemical and Biochemical Engineering

Microbial Growth Kinetics: Thermodynamic principles, Stationary cell growth, Growth yield, Specific growth rate, Product yield, Saturation constant, Biomass energetics, Yield equations. Scale-up Studies: Criteria for translation between two scales of operation, Non-

geometric scale-up. Mass Transfer in Microbial System: Fluids and its properties, Non-Newtonian fluids, Gas–liquid mass transfer, Oxygen transfer and utilization in gassed microbial system, mass transfer resistances, and heat transfer coefficient correlations.

BT615 DNA Sequencing and analysis

Micro-Robotics in DNA Sequencing; use of small-scale instrumentation involved in DNA sequencing. DNA Shearing Techniques for Shotgun Sequencing in Genomics; different techniques in DNA preparation. Ion-torrent technology and applications: DNA Sequencing

BT616 Molecular Pharmacology and Pharmacogenomics

Using receptor theory and molecular models, the mechanisms of drug response in body systems are explored. It is the study of the interaction between drug or neurotransmitter and receptor, the interaction between receptor and cell, and the relationship between receptors and drug design. In addition to the role of recombinant DNA technology and its use within the field

BT617 Molecular Phylogenetic Techniques

The course will concentrate on the understanding and use of a variety of computational tools designed to extract meaningful biological information from molecular sequences. Lectures will provide information on the conceptual essence of the algorithms that underlie various sequence analysis tools and the rationale behind their use. Only programs that are freely available, as either downloadable executables or as Web servers, will be used in this course.

BT618 Nanoscience in biotechnology

The aim of this course is to convey a well-founded, wide-ranging basis of knowledge for developing, implementing and evaluating nanobiotechnological applications. Course graduates will be able to assess the manifold interrelationships and effects of these technologies. On this basis, they will have the ability to prepare nanomaterials from

biological sources and be aware of its characterization and bioapplication.